NANTICOKE
ENVIRONMENTAL COMMITTEE

1984 AIR QUALITY
DATA SUMMARY

November, 1985

Ontario
Ministry of the Environment

The Honourable
Jim Bradley
Minister

Rod McLeod
Deputy Minister

NANTICOKE ENVIRONMENTAL COMMITTEE

1984 AIR QUALITY DATA SUMMARY

Ministry of the Environment
Air Quality Assessment
Technical Support Section
West Central Region
November 1985

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INTRODUCTION

The Nanticoke Environmental Management Program (NEMP) was formed in 1978 to co-ordinate a study into the impact of industrial development on air quality in the area surrounding Nanticoke. NEMP was sponsored jointly by the Federal and Ontario Governments, Ontario Hydro, Stelco and Texaco. Beginning in 1984, the Ministry's West Central Region assumed responsibility for network operations from Air Resources Branch. The monitoring network was reduced and restructured such that a private contractor funded by Texaco and Stelco would provide one technician to maintain the network. In mid-1985, NEMP and a similar group concerned with water quality were amalgamated into one organization called the Nanticoke Environmental Committee. Thus, all future activities will be undertaken under NEC.

The purpose of the monitoring program is to determine compliance with provincial air quality criteria and also to measure the impact of the industrial development on the local air quality. Contaminants which may enter the area from outside sources should also be identified.

The three main industries which have located in Nanticoke are Ontario Hydro's Thermal Generating Station, Texaco's oil refinery and Stelco's basic steel plant. A few smaller industries have located in the area as well.

NEMP/NEC has undertaken to measure the ambient air concentrations of those compounds or substances that are regulated under the Provincial and Federal Environmental Protection Acts, and that could be a result of the Nanticoke industries' activities. The Ontario Ministry of the Environment's air quality criteria are set for the protection of human health and well being as well as to protect vegetation, animal life and property.

MONITORING NETWORK

Monitoring stations have been located to take into account predominant wind patterns and source location as well as to differentiate to the degree possible between industrial and other contributions.

A map of the 1984 network is shown in Figure 1 and the pollutants measured at each location are given in Table 1. Wind data (speed and direction) were measured at both Long Point and near Jarvis. The latter station's wind data were utilized in a computer program known as a "pollution rose" (the Jarvis data were slightly more complete than Long Point's). A pollution rose is essentially a cross-tabulation of average hourly pollutant concentrations with wind direction classes. The pollution roses for individual stations are illustrated graphically on several maps in the report. For each "rose" presented, the length of each individual line drawn is proportional to the average concentration when the wind was blowing from that direction. The data from this program are a useful tool in identifying sources of pollutants.

In addition to the NEMP monitoring network, Ontario Hydro has operated its own network of sulphur dioxide analyzers since 1970. Some of these data are referred to in this report.

ANALYSIS OF DATA

Sulphur Dioxide

Sulphur dioxide (SO_2) was measured continuously at five sites within the NEMP network and at eight Ontario Hydro stations in 1984. All of the stations easily met the annual and daily air quality objectives of .02 and .10 ppm respectively. Data from the Ministry monitors are given in Table 2. The 1-hour objective of .25 ppm was exceeded during a combined total of 9 hours at six locations out of a total of over 100,000 hours of monitoring. All nine incidents were likely caused by short term fumigations resulting from the Generating Station's plume. The greatest number of exceedences at any one station was 3 hours measured by an Ontario Hydro monitor. One Ministry station measured 2 exceedences and four Ontario Hydro monitors each recorded one.

Pollution roses for SO_2 in Figure 2 for the five Ministry monitors generally show a discernible impact from the Nanticoke industries (with the exception of Long Point) as highest averages were related to winds from the industrial area. The Long Point station showed very low levels and indicated a minor importation of SO_2 from the United States.

Figure 7 illustrates the historical trend of sulphur dioxide annual average concentrations for eight SO_2 monitors which have operated continuously since 1976. Concentrations can be seen to be very uniform over this nine year period with no deterioration in concentrations. Similarly in Figure 8, the number of hourly exceedences per year at these eight stations is shown. Only random fluctuation is apparent.

Total Reduced Sulphur

Total Reduced Sulphur (TRS) is monitored at three locations -

Nanticoke Village, South Walpole School on Sandusk Rd. and on Cheapside Rd. just south of Highway 3. There are no general criteria for TRS but there is an hourly objective for hydrogen sulphide (H_2S), the "rotten egg" gas, of 20 ppb, which is based on its odour threshold. The monitor measures H_2S and many other sulphur compounds as a whole.

Sources of these pollutants include slag quenching activities at Stelco and fuel oil storage tanks and a sulphur recovery operation at Texaco. Apart from industrial sources, sulphur compounds can be liberated from groundwaters that have been contaminated by natural seepages or from leaking natural gas wells, known to exist in the area. Stelco emissions have been shown to consist primarily of H_2S and thus, comparison of TRS data to the H_2S objective, particularly within Nanticoke Village when downwind of Stelco, is feasible. Texaco emissions have been less well characterized but are not believed to consist primarily of H_2S. Other organic sulphur compounds are probably present in their emissions and consequently levels downwind of Texaco cannot be rightfully compared to the H_2S standard. The TRS data are summarized in Table 3.

In 1984, a moderate deterioration in TRS levels occurred at the three stations. Only the South Walpole School site showed a significantly higher yearly average (Figure 9) but all three stations showed more incidents above an arbitrary flag concentration of 8 ppb (Figure 10) and the H_2S objective of 20 ppb (Table 3). The latter objective was exceeded twice at South Walpole School and 11 times in Nanticoke Village (bearing in mind that the objective is not truly applicable at the school downwind of Texaco). The school site is primarily affected by the Texaco plant while the Village is affected mostly by Stelco. Highest levels were measured within the Village. Pollution roses in Figure 3 generally indicate the influence of the two plants.

It should be noted that although the H_2S objective is only occasionally exceeded, valid odour problems can at times occur in Nanticoke Village and at the school. The difficulty in comparing odours to measured hourly averaged levels arises in the instantaneous detection of odorous sulphur compounds by the human nose. Odours can be only of a short term nature, insufficient to yield an elevated hourly average. Thus, the hourly H_2S objective is currently being reviewed to take this factor into account.

Oxides of Nitrogen

Oxides of nitrogen result from high temperature combustion sources including the automobile. The most abundant oxides are nitric oxide (NO) which is largely a direct emission and nitrogen dioxide (NO_2) which is mostly an oxidation product. Objectives exist only for nitrogen dioxide and are based on odour threshold levels (hourly-.2 ppm) and health effects (24-hour - .01 ppm). Other adverse effects occurring at higher levels include vegetation damage, reduced visibility and corrosion of metals.

Data for NO_2 and NO for three stations are summarized in Tables 4 and 5. Levels in 1984 continued to be very low and well within objectives. There have never been any NO_2 exceedences measured.

The pollution roses in Figure 4 indicate little contribution from the Nanticoke industries. The higher average levels measured at the Simcoe site are probably due to this being an older model instrument than the other two. It has more technical problems which interject a slight positive bias to the yearly average.

Yearly trends of NO_2 for the three stations are given in Figure 11. In the past few years a trend to decreasing

concentrations is apparent.

Hydrocarbons

Ambient hydrocarbons can come from vehicular traffic, seepages at natural gas wells, natural by-products of vegetation, the commercial processing and transportation of refined petroleum products (Texaco) and coking operations (Stelco).

The instrument utilized is capable of detecting a large spectrum of individual compounds with varying adverse impacts. Since mixtures of compounds vary from place to place, it has been impossible to apply a guideline or objective to the measured concentrations.

The instrument separates the hydrocarbons into two fractions- methane and non-methane, the latter referred to as "reactive" hydrocarbons (RHC). Data for reactive hydrocarbons for 3 stations are given in Table 6 and data for methane for two stations are given in Table 7. In 1984, concentrations of reactive hydrocarbons were very similar at the three sites and the pollution roses in Figure 5 show fairly uniform concentrations from all directions indicating little impact from the local industries. Concentrations of methane at the two stations were also similar and probably reflected background levels.

Yearly trends are given in Figures 12 and 13 and indicate stable levels of methane dating back to 1980. The decreasing trend of reactive hydrocarbons should be overlooked since data prior to 1984 are believed to be in error due to instrumentation problems. As with methane, RHC levels have probably remained stable.

Ozone

Oxidants are products of photochemical reactions involving oxides of nitrogen, hydrocarbons and sunlight. Ozone (O_3) accounts for most of the oxidants produced and the sources of the precursor pollutants are mainly industrial and automotive. Ozone is injurious to different types of vegetation including tobacco and tomato crops. The 1-hour objective for ozone (.08 ppm) is based on vegetation effects, however, ozone can also have adverse human health effects at higher levels.

Ozone concentrations follow very definite annual and daily trends. Highest levels occur during the summer (May to September), and the daily maximums usually occur during mid-afternoon. Both patterns are directly related to temperature and the amount and intensity of sunlight.

Ozone concentrations were measured at two sites in 1984 and data are summarized in Table 8. In 1984, concentrations were similar to previous years but slightly fewer exceedences of the hourly objective occurred. Nevertheless, there were still 144 exceedences observed at Long Point and 123 at Simcoe. Elevated levels at the two stations generally occurred concurrently during the summer with slightly higher concentrations measured at Long Point and usually during southerly winds indicating that the high concentrations were imported from the United States. There were 35 separate days during the summer in which one or both stations exceeded the hourly objective.

The pollution roses in Figure 6 confirm that highest averages occurred under winds from the south and southwest although

the relative magnitudes were not all that much greater than other directions. This is because the rose is computed for the entire year rather than just peak periods. Elevated concentrations do not automatically occur with southerly winds, even during the summer. Specific meteorological conditions are necessary.

The yearly trend graphs of annual averages and number of hourly exceedences at the two stations in Figures 14 and 15 indicate random fluctuations which are probably related to climatological variation.

Ozone, hydrocarbons and oxides of nitrogen can be transported over great distances and can be augmented by local sources. It is generally believed that the ozone problem in Southern Ontario is due to long range transport from the United States and thus will have to be resolved on a regional rather than local scale.

Total Suspended Particulates

Total suspended particulates (TSP) are measured with high volume samplers which draw a known volume of air through a pre-weighed filter for a 24 hour period (midnight to midnight). The exposed filter is weighed, and the difference (weight of solids on filter) in conjunction with the known air volume sampled is used to calculate a TSP concentration in micrograms per cubic metre. The objective for a 24 hour average is 120 ug/m^3 while the yearly geometric mean objective is 60 ug/m^3. The samplers operate once every six days.

TSP was measured at 13 hi-vol sites in 1984, and all stations met the yearly objective as given in Table 9. Concentrations

were highest on average within Nanticoke Village, only slightly below the yearly objective. One station (Cheapside) showed two exceedences of the daily objective, both related to farming activities. Eight other locations recorded one exceedence - most on April 30 when a severe windstorm created elevated levels throughout the Region.

A total of seven stations have been operating continuously since 1979, and the combined yearly trend of these stations is shown in Figure 15. No deterioration is evident. However, levels within Nanticoke Village, close to Stelco operations, remain a concern and trends here will be carefully monitored. Stelco's impact on particulate levels would appear to be limited by distance.

Dustfall

Dustfall is that material which settles out of the atmosphere by gravity. It is collected in plastic containers during a 30 day exposure time. The collected material is weighed and expressed as a deposition rate of grams/square metre/30 days. The measurement is imprecise and effects are restricted to relatively local areas. Dustfall objectives are based on nuisance effects and are 7.0 grams/m^2/30 days (monthly) and 4.5 grams/m^2/30 days (yearly average). Since dustfall is comprised solely of large particles, it is not a health related parameter.

Dustfall was measured at one location within Nanticoke Village in 1984, and data are given in Table 10. As in previous years, concentrations were very low and well below the monthly objective with one exception. The June sample gave an extremely high reading - the first of its kind dating back to 1974. The source of this reading is unknown.

The annual trend at this station since 1975 is given in Figure 17. No deterioration is evident with the exception of 1984 which was entirely due to the single result discussed above. Annual levels have remained essentially stable over the 10 years and are well below the yearly objective.

It should be noted that although the air quality particulate objectives were mostly met in 1984, valid complaints concerning short term soiling episodes, particularly at Ontario Hydro and Stelco, did occur and were properly addressed and investigated. Such investigations are continuing in 1985.

Fluoridation

This measurement is a relatively crude assessment used to determine quantities of fluoride compounds in the ambient air. A lime coated paper is exposed to the atmosphere for approximately 30 days and chemically analyzed for fluoride. The fluoride objectives are based on vegetation damage and for this reason, the objective is more stringent during the growing season. For the period April 15 to October 15, it is 40 micrograms/100 square centimetres/30 days while for the remainder of the year it is 80. A possible source of this contaminant is Stelco's basic oxygen furnace, although gas scrubbing removes most of the emissions.

Fluoridation was measured at nine locations in the Nanticoke area and 1984 data are given in Table 11. Concentrations in 1984 remained very low and well within the objectives with little variation from site to site.

The combined annual trend of these stations dating back to 1975 is shown in Figure 18 and indicates little change in levels.

SUMMARY

Overall, 1984 air quality data in the Nanticoke area reflected a relatively minor albeit discernible impact by the main industries. Pollutants such as oxides of nitrogen, hydrocarbons and fluoridation rates showed quite low levels well within relevant objectives.

Other parameters such as total reduced sulphur (TRS) and sulphur dioxide (SO_2) normally showed zero or near zero concentrations. However, both showed several hours above objectives. TRS levels and possible odour problems particularly within Nanticoke Village are of concern. The effect of the Nanticoke Generating Station on SO_2 levels would appear to be minor. Only 9 hours of over 100,000 hours of monitoring exceeded the hourly objective.

Particulate levels in the Region were also quite low and generally showed acceptable concentrations. However, as with TRS, Nanticoke Village particulate levels remain a concern. One particularly high but unexplained dustfall reading was observed there and the annual geometric mean concentration for suspended particulate was only slightly below the objective. Particulate trends within the Village will be carefully monitored.

Another pollutant of concern is ozone, a product of long range transport. Elevated concentrations above objectives continued to be observed in 1984 and appeared to arrive mostly from the United States during the summer. Oxidant control will be required on a Regional rather than local scale.

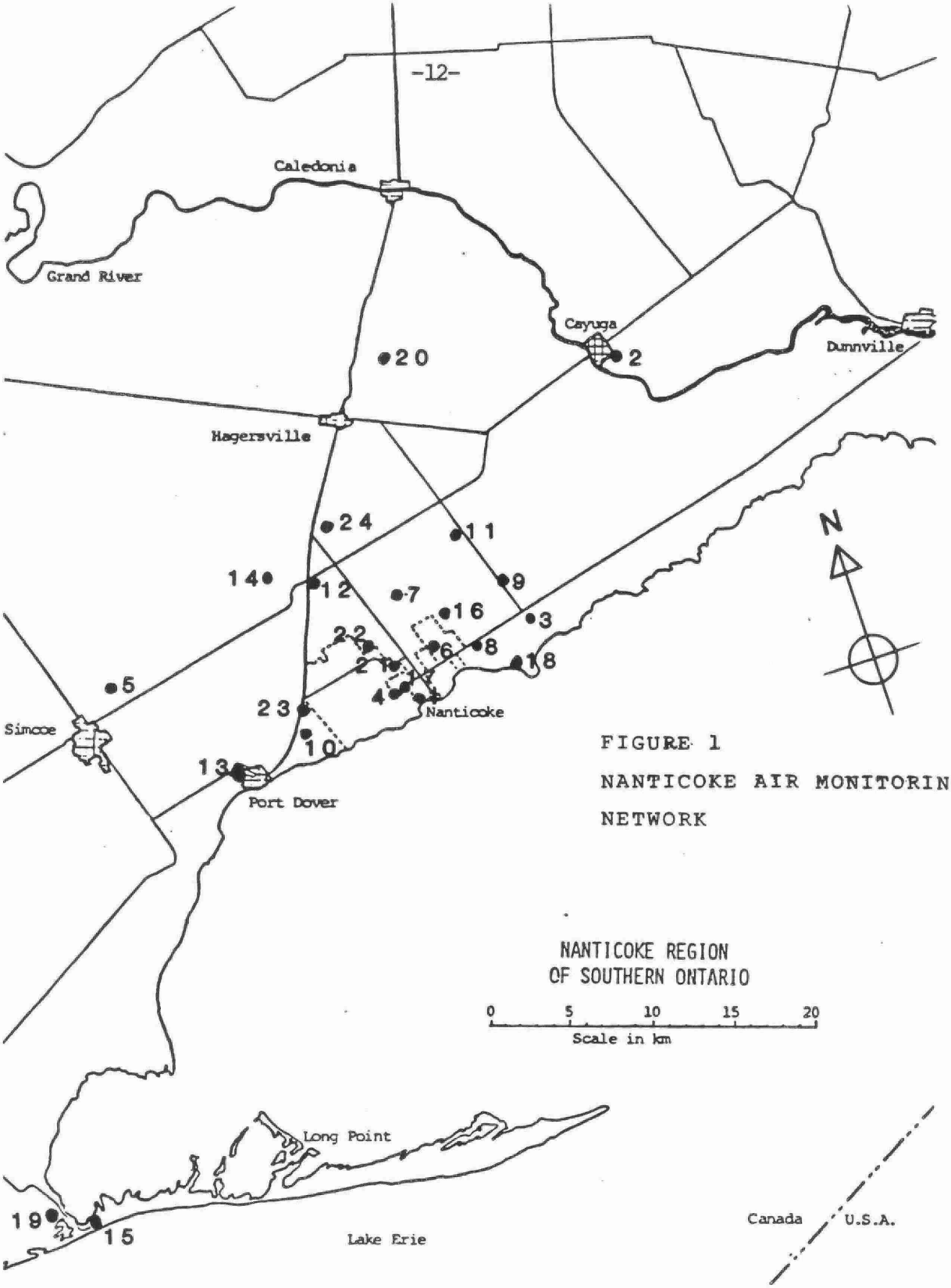


FIGURE 1
NANTICOKE AIR MONITORING
NETWORK

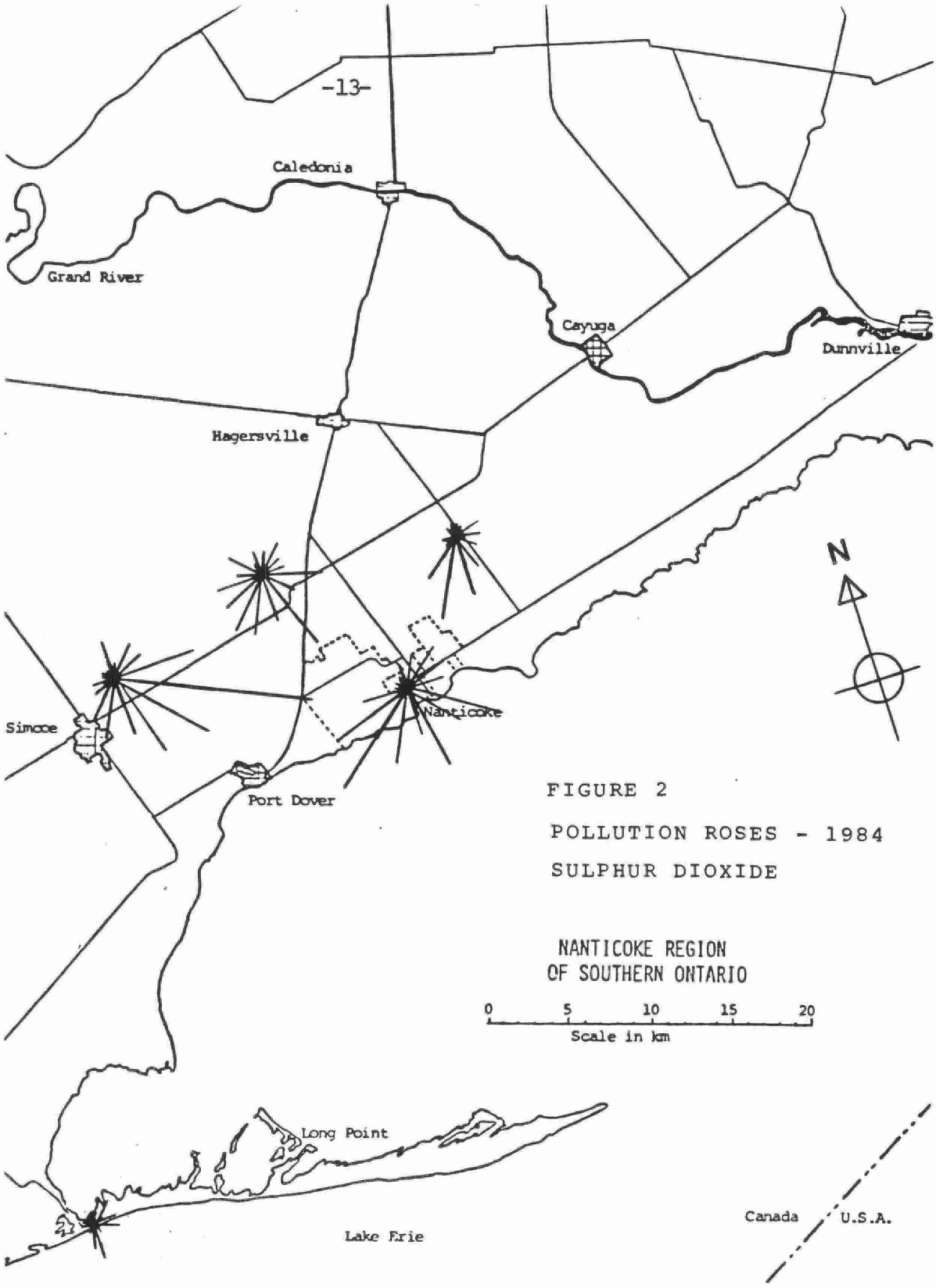


FIGURE 2

POLLUTION ROSES - 1984

SULPHUR DIOXIDE

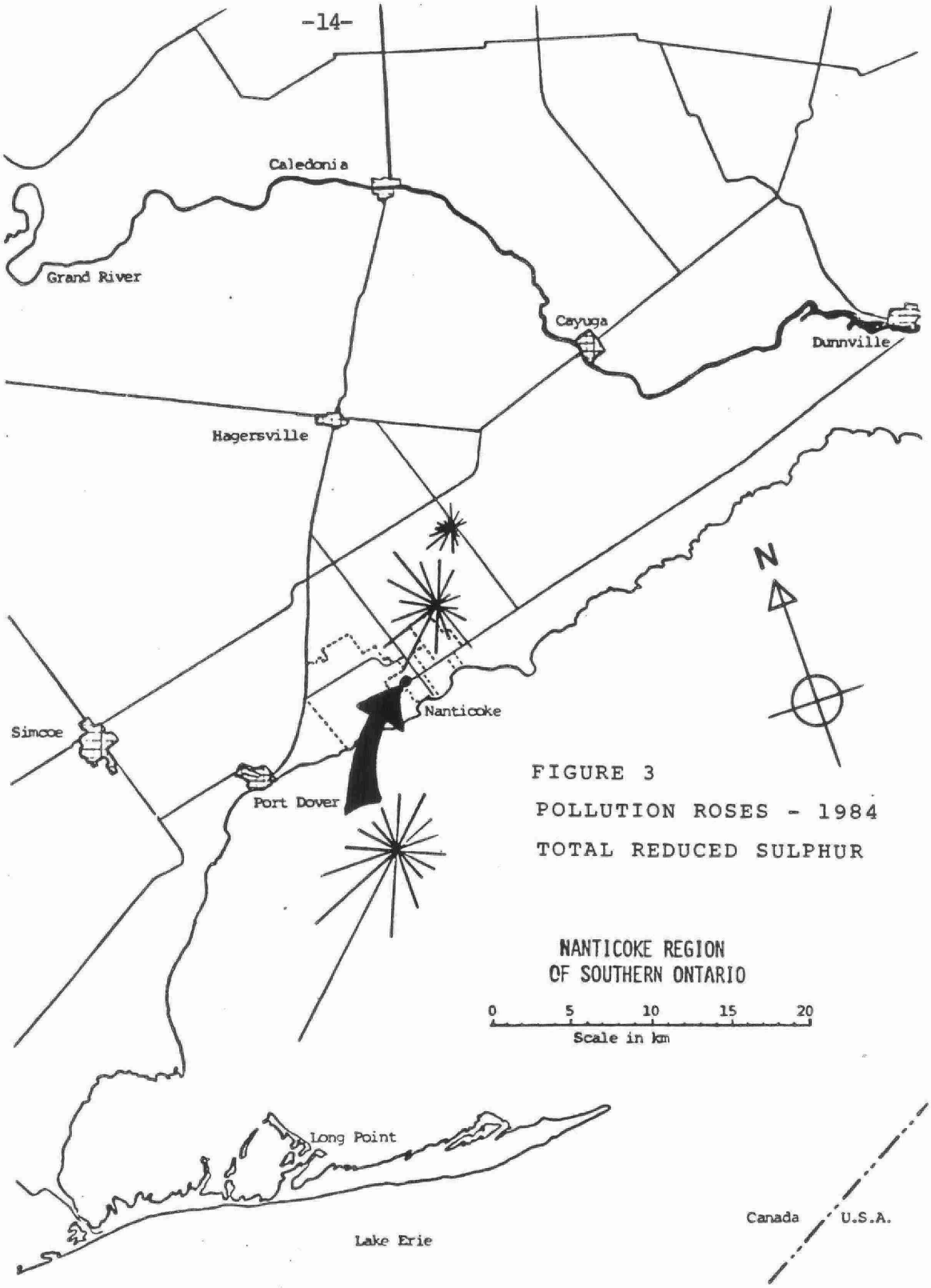


FIGURE 3

POLLUTION ROSES - 1984

TOTAL REDUCED SULPHUR

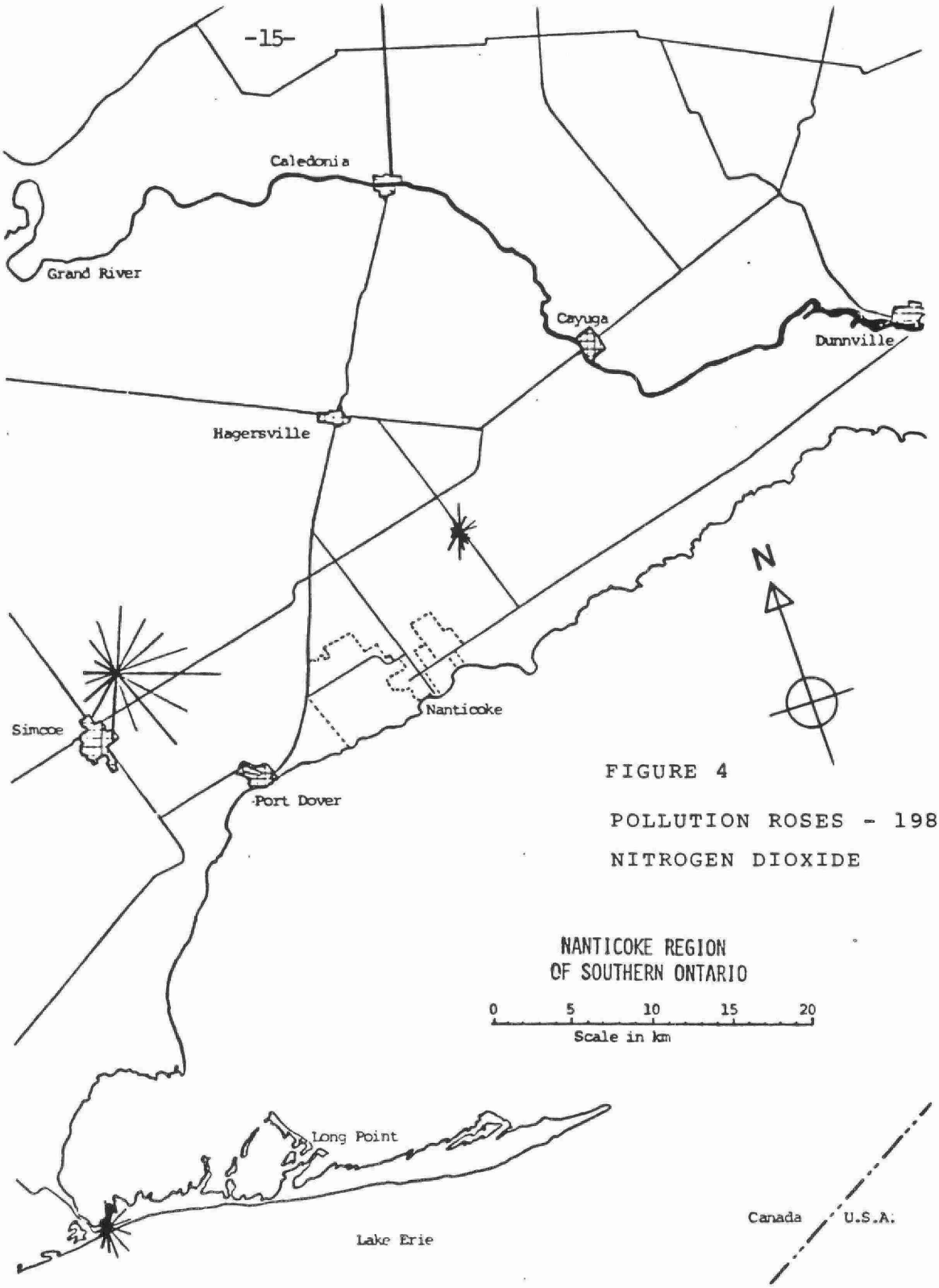


FIGURE 4

POLLUTION ROSES - 1984

NITROGEN DIOXIDE

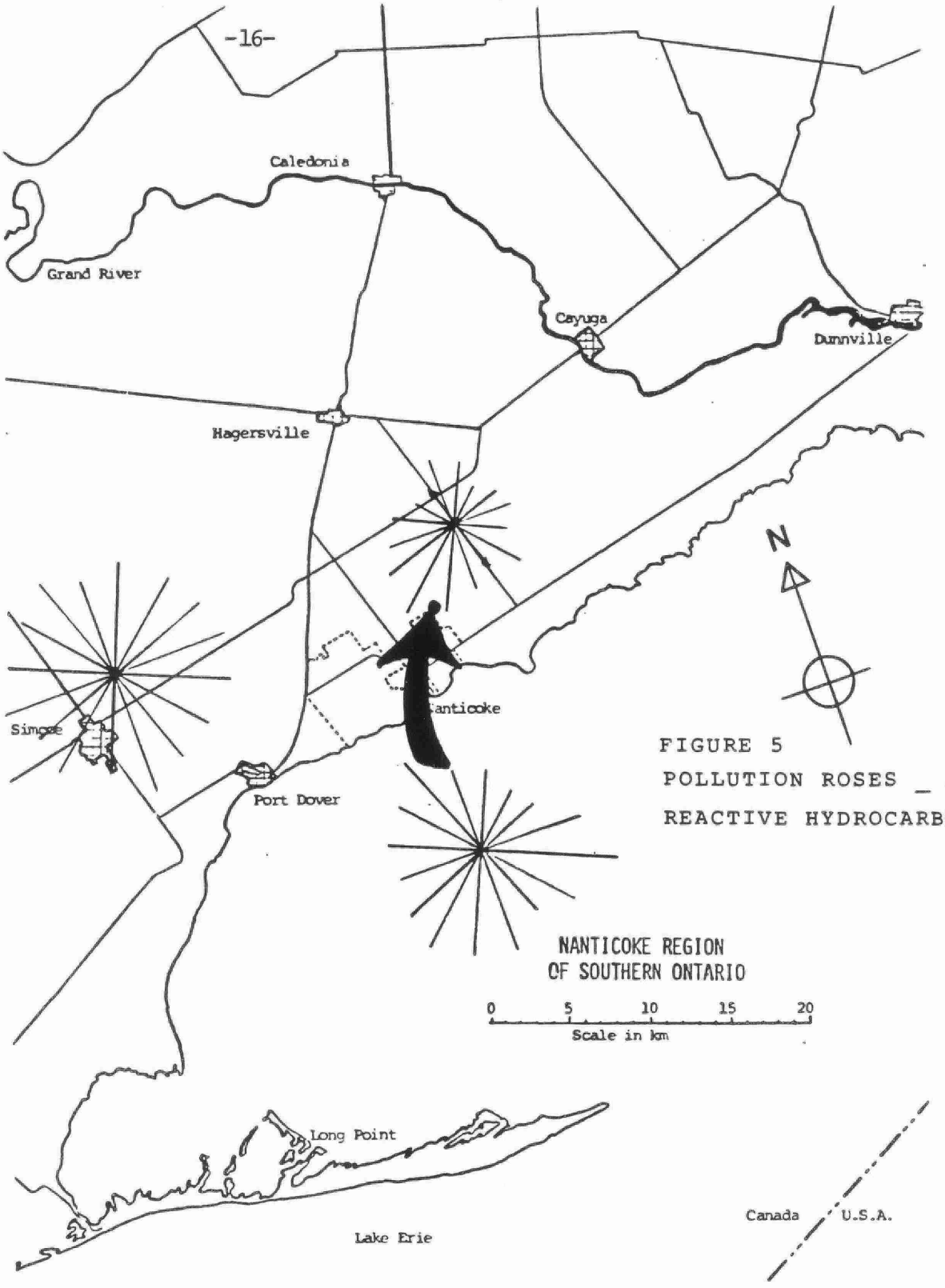


FIGURE 5
POLLUTION ROSES _ 1974
REACTIVE HYDROCARBONS

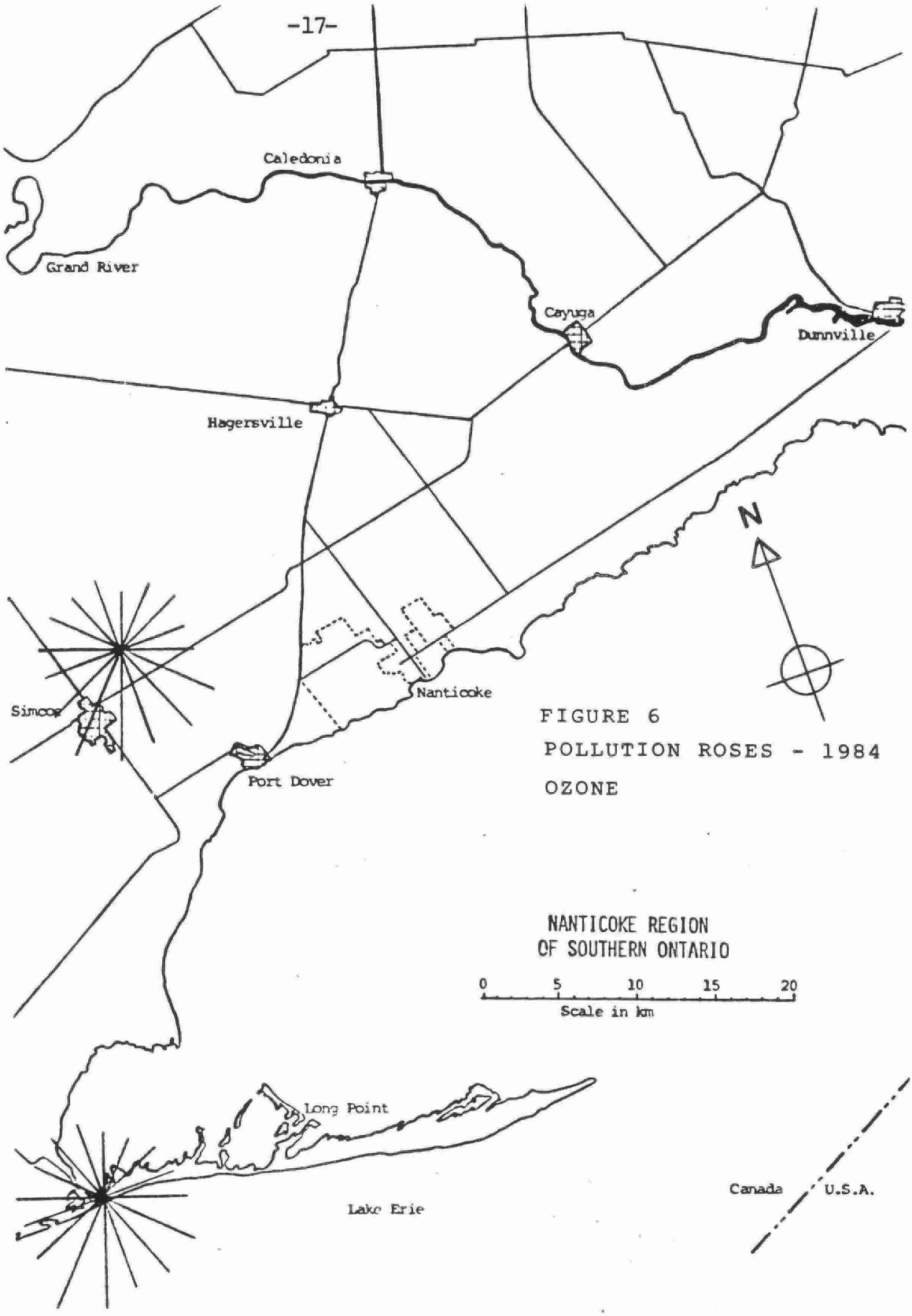


FIGURE 6
POLLUTION ROSES - 1984
OZONE

FIGURE 7

SO_2 ANNUAL AVERAGE CONCENTRATIONS

AVERAGE OF 8 STATIONS

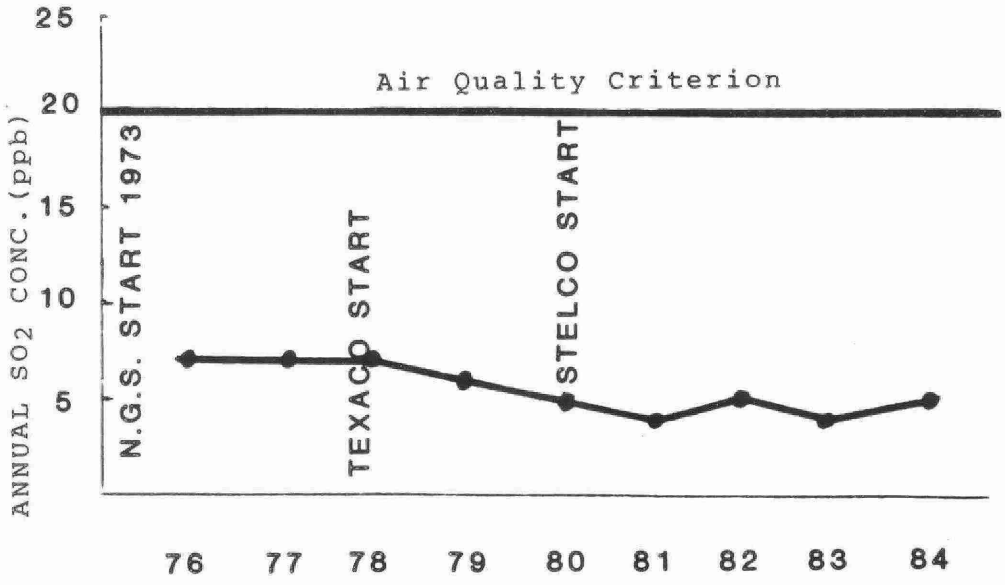


FIGURE 8

NUMBER OF HOURS EXCEEDING 1-HOUR

SO_2 CRITERION(250 ppb)

(8 STATIONS)

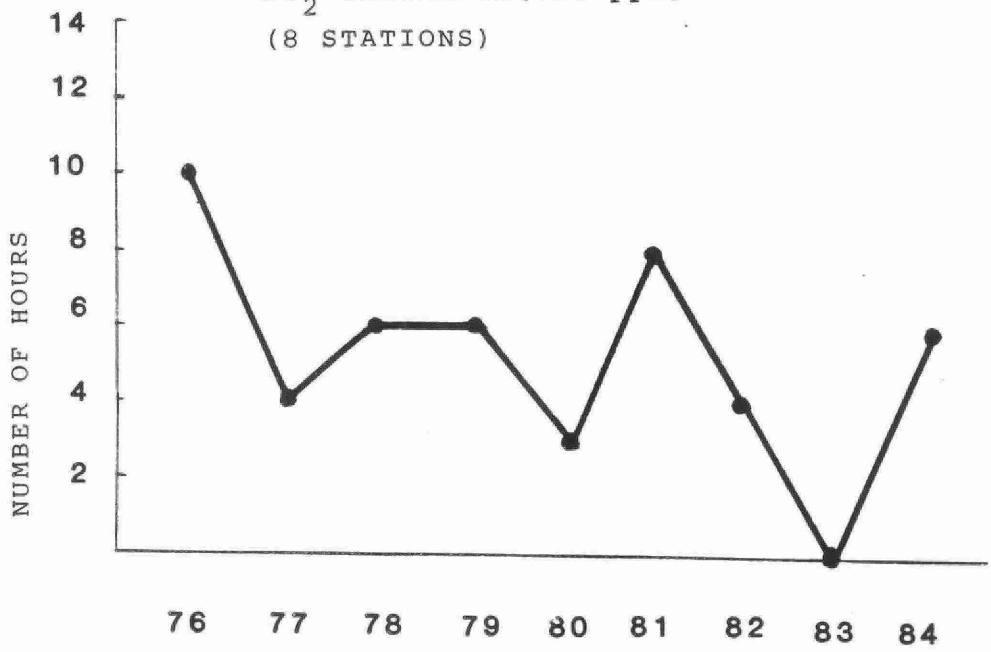


FIGURE 9
TOTAL REDUCED SULPHUR(TRS)
ANNUAL AVERAGE CONCENTRATIONS

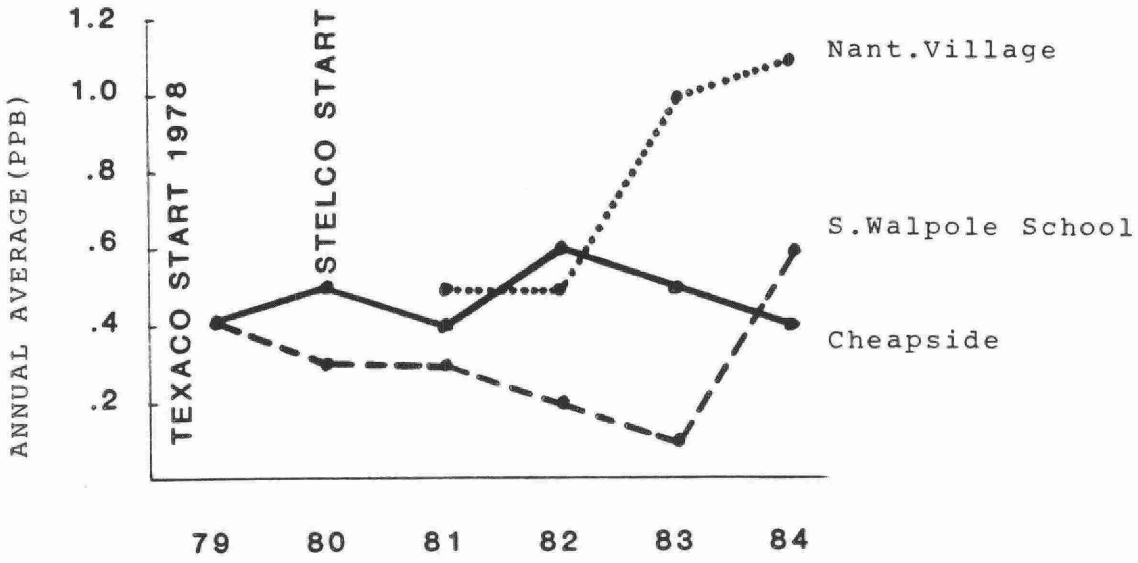


FIGURE 10
NUMBER OF HOURS TRS
EXCEEDED 8 PPB

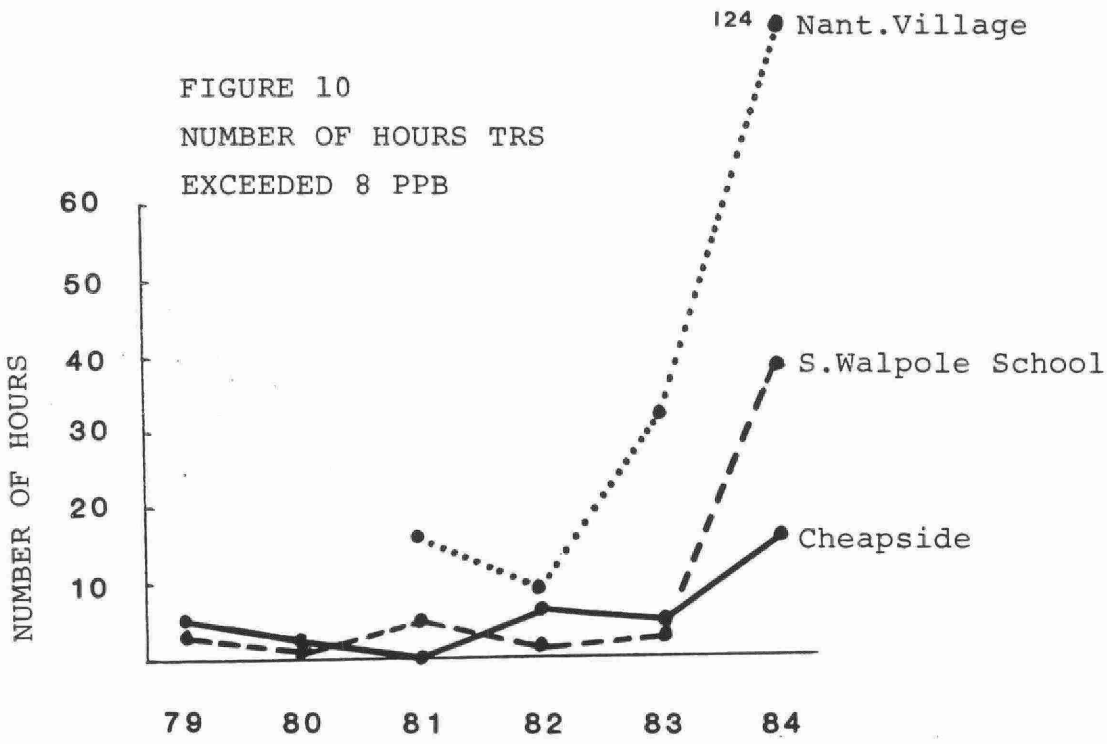


FIGURE 11
NO_2 ANNUAL AVERAGE CONCENTRATIONS

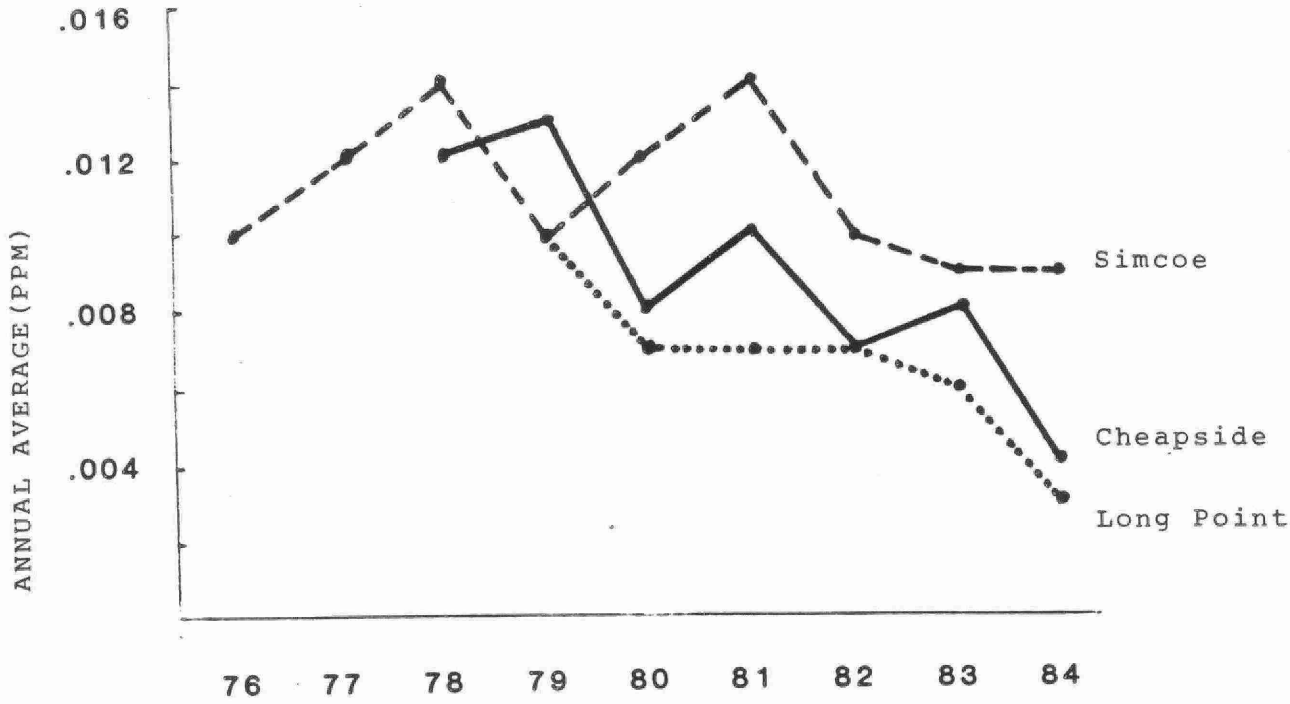
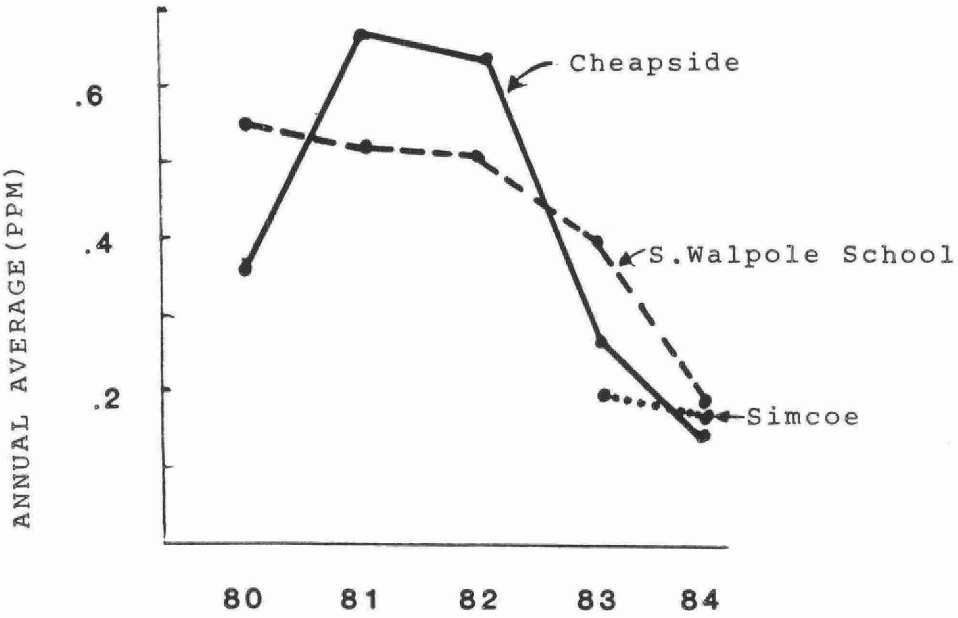


FIGURE 12
REACTIVE HYDROCARBONS
ANNUAL AVERAGE CONCENTRATION



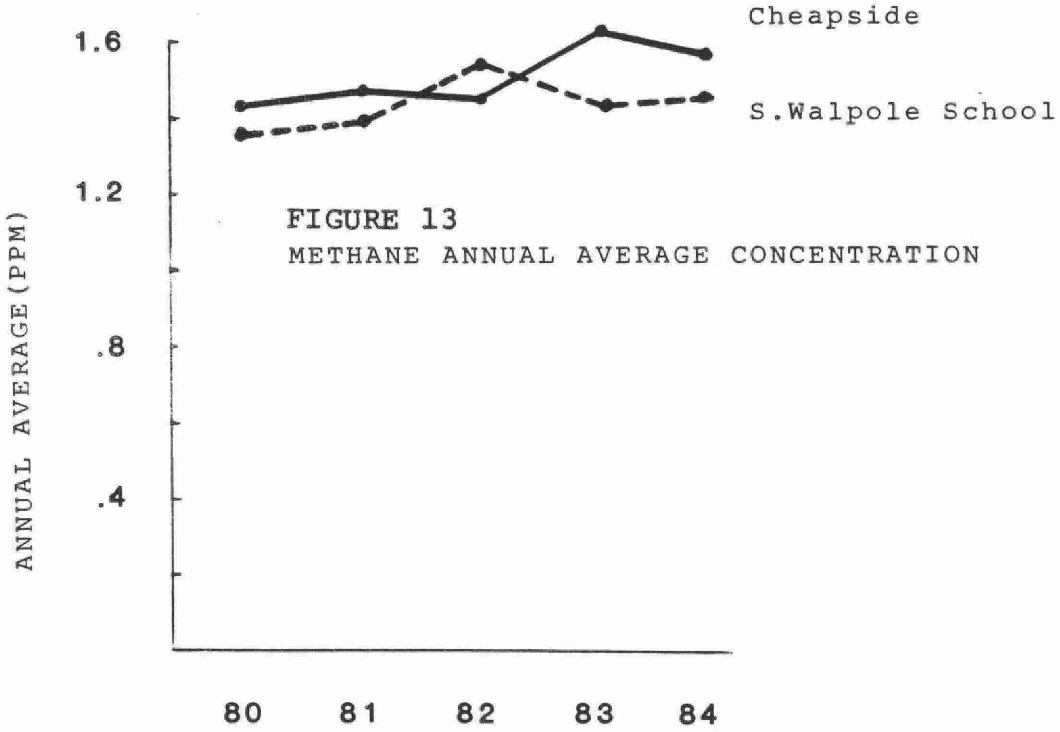


FIGURE 13
METHANE ANNUAL AVERAGE CONCENTRATION

FIGURE 14

OZONE ANNUAL AVERAGE CONCENTRATION

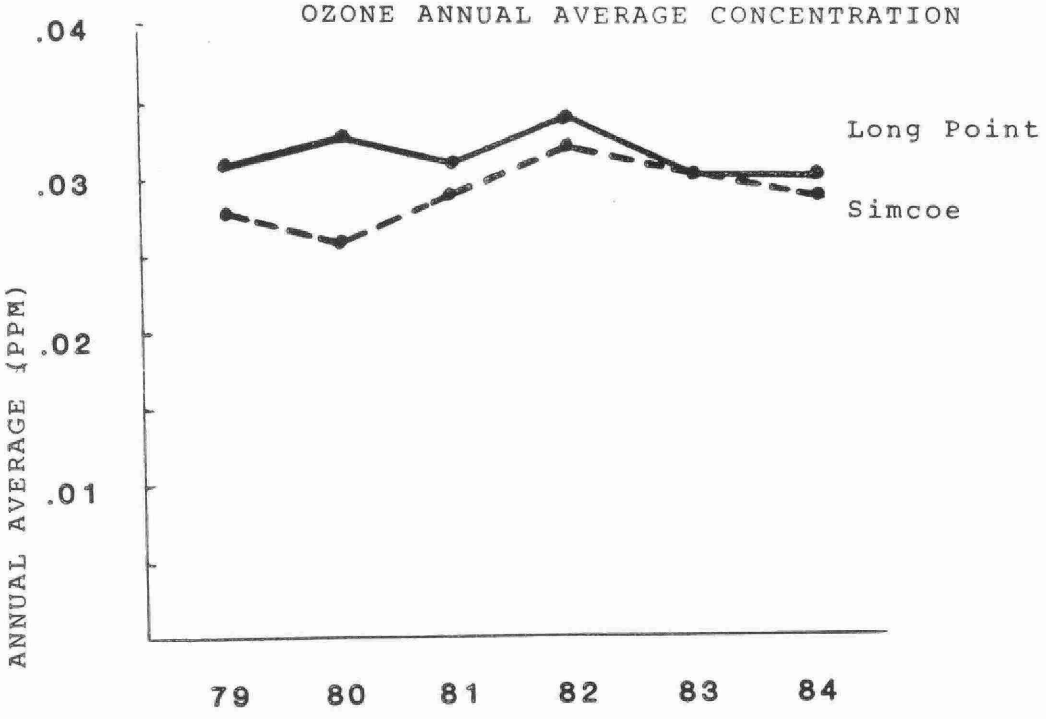


FIGURE 15

NUMBER OF HOURS EXCEEDING 1-HOUR OZONE CRITERION (80 ppb)

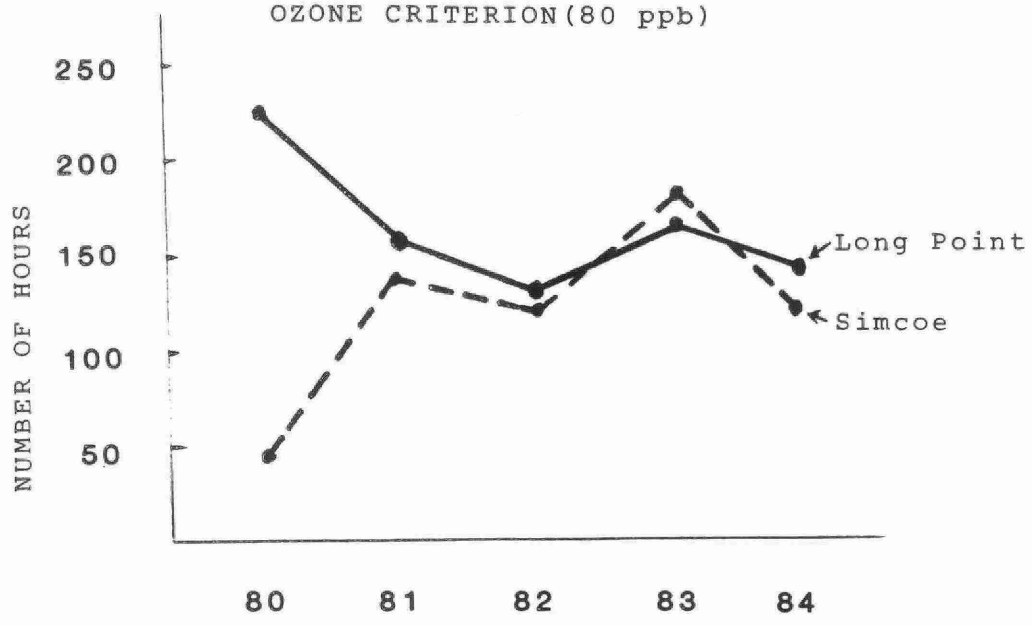


FIGURE 16
TOTAL SUSPENDED PARTICULATE
ANNUAL GEOMETRIC MEAN
AVERAGE OF 7 STATIONS

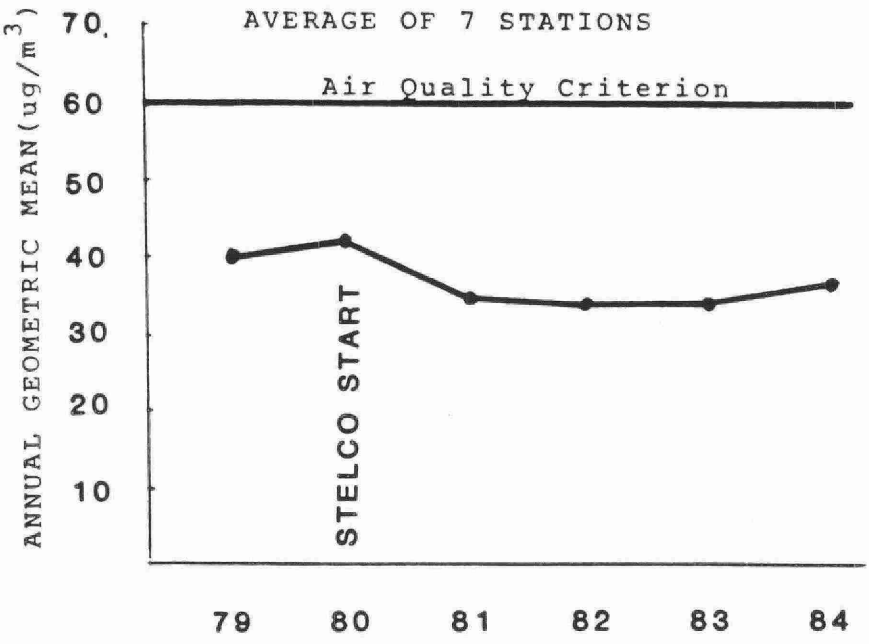
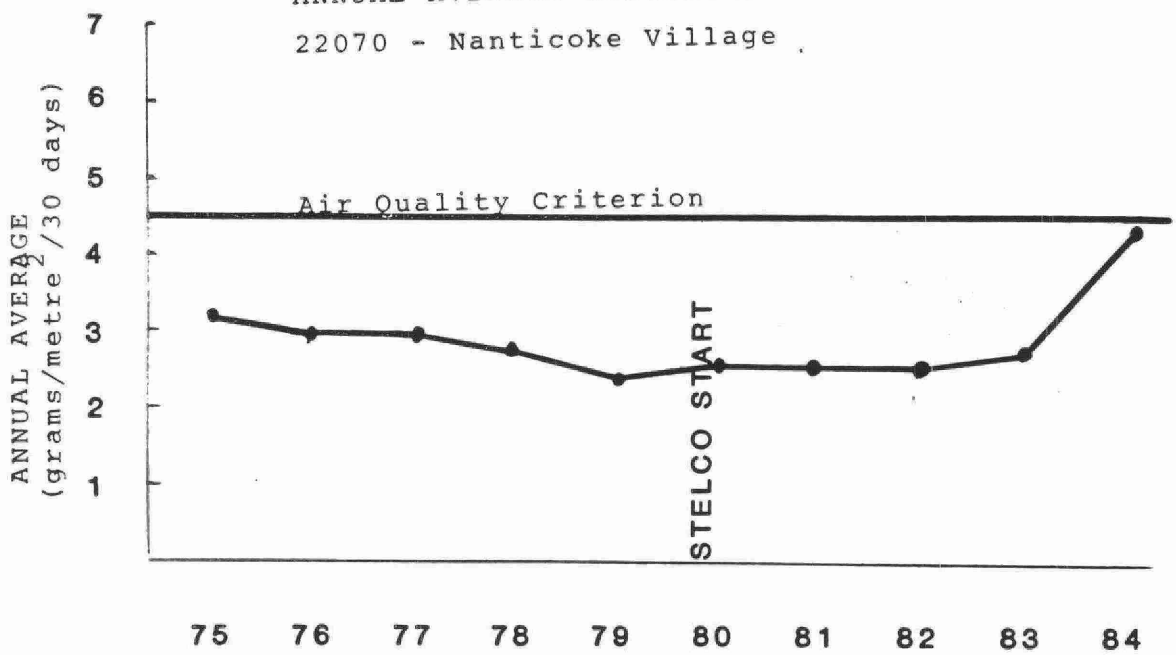


FIGURE 17
DUSTFALL
ANNUAL AVERAGE CONCENTRATION
22070 - Nanticoke Village



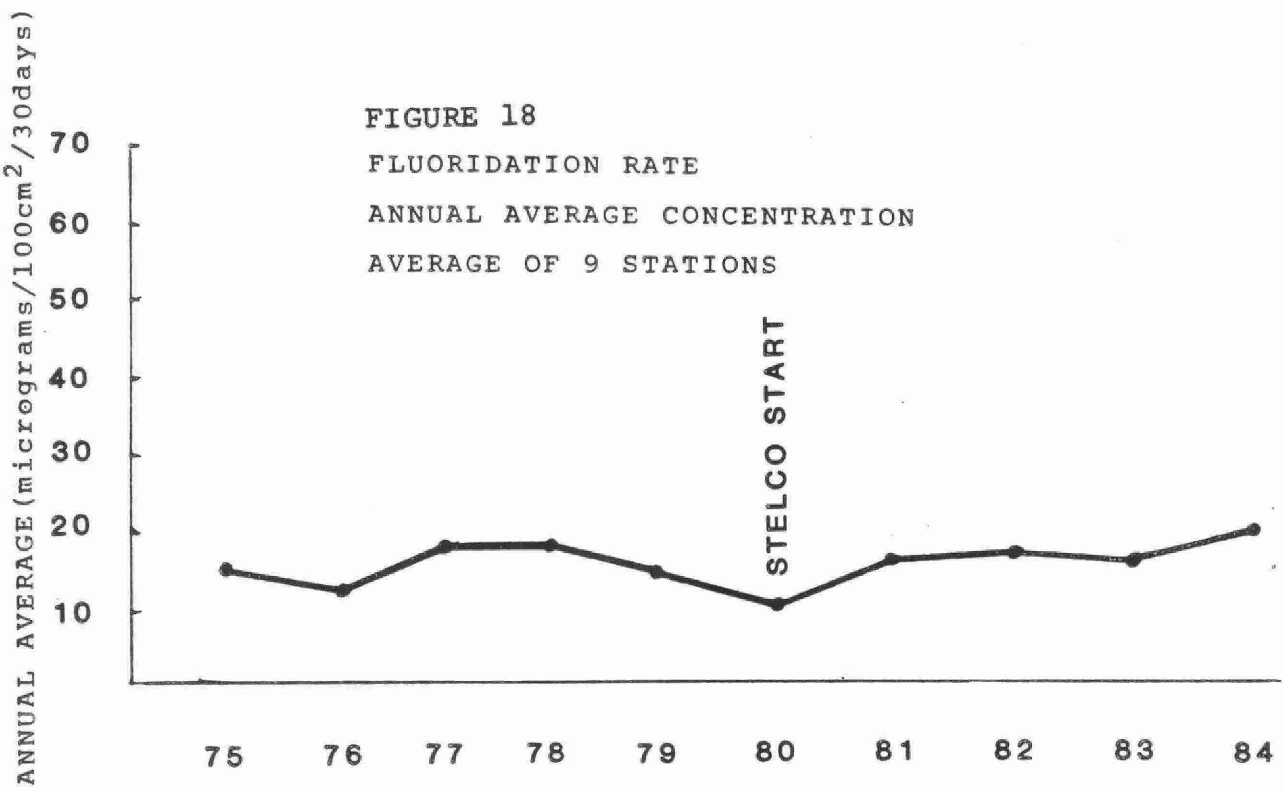


FIGURE 18

FLUORIDATION RATE

ANNUAL AVERAGE CONCENTRATION

AVERAGE OF 9 STATIONS

TABLE 1
MONITORING NETWORK

Map Ref.	Number	Location	SO_2	TSP	CHx	TRS	O_3	NOx	DF	F	Wind/Temp
1	22057	Nanticoke Creek								X	
2	22063	Cayuga								X	
3	22066	Woodlawn Park								X	
4	22070	Nanticoke Village							X		
5	22071	Simcoe	X	X	X		X	X		X	
6	22074	Texaco								X	
7	22075	Sandusk Rd/4th Conc.								X	
8	22078	Rainham Rd/Sandusk								X	
9	22079	Cheapside/2nd Conc.								X	
10	22083	Dogs Nest								X	
11	22086	Cheapside	X	X	X	X		X			
12	22087	Jarvis		X							
13	22090	Port Dover		X							
14	22091	Townsend	X	X							

SO_2 - sulphur dioxide
TSP - total suspended particulate
CHx - hydrocarbons
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride

TABLE 1 (continued)
MONITORING NETWORK

Map Ref.	No.	Location	SO_2	TSP	CHx	TRS	O_3	NOx	DF	F	Wind/Temp
15	22901	Long Point	X				X	X			X
16	22904	S. Walpole School		X	X	X					
17	22907	Nanticoke Village	X	X		X					
18	22952	Peacock Pt. Park		X							
19	22959	Big Creek		X							
20	22960	Dufferin		X							
21	22961	Nanticoke North		X							
22	22964	Stelco North		X							
23	22965	Dogs Nest/Hwy. 6		X							
24	22883	Jarvis Met Tower (Ontario Hydro)									X

SO_2 - sulphur dioxide
TSP - total suspended particulate
CHx - hydrocarbons
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride

TABLE 2
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION

Ontario Objectives: 1-hour - .25
24-hour - .10
1-year - .02

			Annual Average	Maximum 1-hour	Maximum 24-hour	No. of Times Above Objective 1-hour	No. of Times Above Objective 24-hour
22071	Simcoe	1984	.004	.20	.04	0	0
		1983	.003	.21	.04	0	0
		1982	.004	.22	.03	0	0
22086	Cheapside	1984	.004	.07	.03	0	0
		1983	.008	.05	.03	0	0
		1982	.007	.09	.04	0	0
22091	Townsend	1984	.003	.35	.05	2	0
22901	Long Point	1984	.002	.15	.04	0	0
		1983	.003	.11	.04	0	0
		1982	.004	.14	.04	0	0
22907	Nanticoke Village	1984	.005	.22	.08	0	0

TABLE 3
TOTAL REDUCED SULPHUR
UNITS - PARTS PER BILLION

Ontario Objective: 1-hour -20
(Hydrogen Sulphide)

			Annual Average	Maximum 1-hour	No. of Hours Above Objective
22086	Cheapside	1984	.4	14	0
		1983	.5	10	0
		1982	.6	9	0
22904	South Walpole School	1984	.6	106	2
		1983	.1	17	0
		1982	.2	12	0
22907	Nanticoke Village	1984	1.1	69	11
		1983	1.0	90	5
		1982	.5	46	1

TABLE 4
NITROGEN DIOXIDE
UNITS - PARTS PER MILLION

Objectives: 1-hour - .20
24-hour - .10

		Annual Average	Maximum 1-hour	Maximum 24-hour	No. of Times Above Objective 1-hour	No. of Times Above Objective 24 hour
22071 Simcoe	1984	.009	.13	.04	0	0
	1983	.009	.08	.04	0	0
	1982	.010	.07	.04	0	0
22086 Cheapside	1984	.004	.07	.03	0	0
	1983	.008	.05	.03	0	0
	1982	.007	.09	.04	0	0
22901 Long Point	1984	.003	.04	.03	0	0
	1983	.006	.04	.03	0	0
	1982	.007	.05	.03	0	0

TABLE 5
NITRIC OXIDE
UNITS - PARTS PER MILLION

		Annual Average	Maximum 1-hour	Maximum 24-hour
22071 Simcoe	1984	.005	.07	.03
	1983	.002	.08	.03
	1982	.002	.08	.02
22086 Cheapside	1984	.001	.12	.02
	1983	.001	.06	.03
	1982	.001	.17	.03
22901 Long Point	1984	.001	.13	.04
	1983	.001	.08	.02
	1982	.001	.05	.01

TABLE 6
NON-METHANE HYDROCARBONS
UNITS - PARTS PER MILLION

			Annual Average	Maximum 1-hour	Maximum 24-hour
22071	Simcoe	1984	.17	2.8	0.3
		1983	.20	0.5	0.4
22086	Cheapside	1984	.15	0.9	0.5
		1983	.27	17.0	1.7
		1982	.64	3.2	2.3
22904	South Walpole School	1984	.19	2.0	0.8
		1983	.40	1.3	1.0
		1982	.51	1.6	1.0

TABLE 7
METHANE
UNITS - PARTS PER MILLION

			Annual Average	Maximum 1-hour	Maximum 24-hour
22086	Cheapside	1984	1.58	3.6	1.9
		1983	1.64	4.7	2.2
		1982	1.46	4.0	1.9
22904	South Walpole School	1984	1.47	3.8	2.9
		1983	1.44	2.6	2.0
		1982	1.55	3.4	2.3

TABLE 8
OZONE
UNITS - PARTS PER MILLION Ontario Objective: 1-hour - .08

		Annual Average	Maximum 1-hour	No. of Hours Above Objective
22071 Simcoe	1984	.029	.115	123
	1983	.030	.123	182
	1982	.032	.115	122
22901 Long Point	1984	.030	.130	144
	1983	.030	.136	169
	1982	.034	.114	131

TABLE 9
SUSPENDED PARTICULATES - 1984
UNIT - MICROGRAMS PER CUBIC METRE

Ontario Objectives:-24-hour-120
1-year geometric mean - 60

	No. of Samples	Geometric Mean 1984	1983	1982	Maximum	No. of Samples Above 120
22071 Simcoe	55	36	32	22	396	1
22086 Cheapside	54	36	39	37	494	2
22087 Jarvis	54	49	46	46	155	1
22090 Port Dover	51	39	29	33	75	0
22091 Townsend	50	36	-	-	172	1
22904 South Walpole School	49	32	33	37	165	1
22907 Nanticoke Village	50	58	-	-	307	1
22952 Peacock Pt. Park	56	32	28	32	133	1
22959 Big Creek	54	30	32	33	73	0
22960 Dufferin	49	41	38	39	353	1
22961 Nanticoke North	55	40	40	37	223	1
22964 Stelco North	58	38	34	36	128	1
22965 Dogs Nest/Hwy 6	47	39	28	32	88	0

TABLE 10
DUSTFALL 1984
UNITS - GRAMS/ SQ. METRE/30 DAYS Ontario Objectives 1 month-7.0
1 year avg 4.5

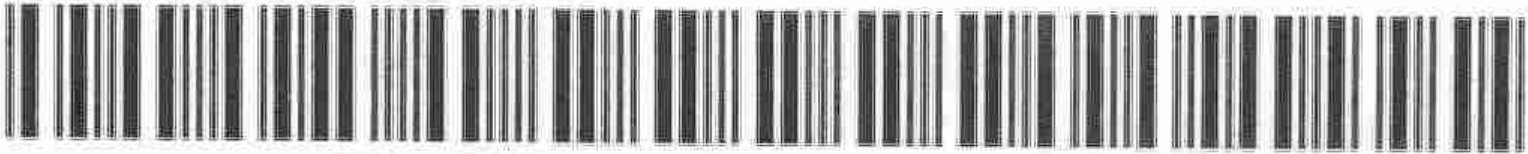
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average 1984	Average 1983	Average 1984
22070 Nanticoke Village	3.4	2.3	2.7	3.0	3.8	18.5	3.4	-	5.0	2.0	2.4	1.8	4.4^{11}	2.8^{9}	2.6^{10}

Underlined values are above objective. Exponents refer to number of months less than 12 valid samples.

TABLE 11
FLUORIDATION RATE - 1984
UNITS - MICROGRAMS F/100 SQ. CM/30 DAYS

Ontario Objectives: Apr.15 to Oct. 15 - 40
Oct.16 to Apr. 14 - 80

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Average 1984	Average 1983	Average 1982
22057	Nanticoke Creek	37	21	22	16	19	20	18	15	7	11	49	37	23	19	21
22063	Cayuga	42	13	17	12	18	18	18	17	7	8	14	13	16	14	18
22066	Woodlawn Park	42	23	23	16	18	17	18	16	4	10	29	20	20	15	15
22071	Simcoe	44	18	20	17	17	16	12	13	6	10	21	13	17	13	13
22074	Texaco	43	17	19	13	23	31	24	18	11	21	24	30	23	16	16
22075	Sandusk/ 4th Conc.	31	11	19	15	17	21	18	20	12	9	24	16	18	14	16
22078	Rainham/ Sandusk	60	15	21	17	22	20	12	19	10	17	26	40	23	19	20
22079	Cheapside/ 2nd Conc.	56	16	20	16	20	17	18	18	11	17	20	23	21	19	19
22083	Dogs Nest	37	13	12	16	17	24	10	12	15	12	20	13	17	16	16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